Maryland Streams Extension Activity One Water Quality Rating



Objective: Students will learn about Water Quality Ratings (WQR) and how to determine whether a stream is healthy.

Procedure: Students will calculate the WQR at each fictional stream site and decide which stream areas are healthy. If the WQR is low, the students will then determine the reason why.

Calculation: Students will be given a fictional stream survey that lists the sensitive, somewhat sensitive, and tolerant macroinvertebrates that were found. Letter codes are given to determine the number of organisms found in a 3-foot by 3-foot area. Next, the students will add up the number of letters in each box. The point values stay the same, regardless of the number of organisms (letter codes). Lastly, they will multiply the number in each box by either 3, 2, or 1 depending on whether the organisms are sensitive, somewhat sensitive, or tolerant.

Example

Letter Codes (A=1-9, B= 10-99, C= 100) – number of organisms fou	ınd
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Sensitive Organisms= 3 points Somewhat Sensitive= 2 points Tolerant= 1 point

SENSITIVE 2 caddisfly larvac hellgrammite A mayfly nymphs gilled snails riffle beetle adult stonefly nymphs water penny larvae	SOMEWHAT SENSATIVE A beetle larvae clams cranefly larvae crayfish damselfly nymphs dragonfly nymphs scuds A sowbugs A fishfly larvae	TOLERANTaquatic wormsblackfly larvae _A leechesmidge larvaepouch snail
2 # of letters times 3 index value	alderfly larvae 3 # of letters times 2 6 index value	/ # of letters times 1 / index value

- Now add together the three index values from each column for your total index value.
- 13 Total index value

Water Quality Rating

Excellent >22 Good

17-22 (Fair

11-16 Poor

<11



TEAM DNR 580 Taylor Avenue Annapolis, MD 21401 www.dnr.statc.md.us Robert L. Ehrlich, Governor Michael S. Steele, Lt. Governor C. Ronald Franks, Secretary W.P. Jensen, Deputy Secretary

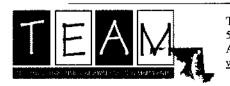




Maryland Streams Extension Activity One Water Quality Rating – Student Survey

Directions: Read each scenario and calculate the Water Quality Rating (WQR) using the stream quality handouts. If the WQR is below a water quality rating of **Good**, state what environmental factors may be affecting the water quality and what you could do to improve the WQR in that stream.

Sample A: Joe Smith is interested in building a home on some property next to the Patapsco River. He is especially interested in buying this property because it seems reasonable. Joe wants to make sure that that the stream is in good condition before he buys the property so he hires you to calculate the WQR. Sample A is located about three quarters of a mile downstream from a metal factory. The factory used solvents to clean the metal and stream water to cool down the metal. Should Joe Smith purchase the property?
Sample B: Susan Button is looking to open a fishing shop, which will sell fishing equipment and bait. Her shop will also offer fishing lessons to anyone that is interested. Susan has found a empty building that is for sale on the Soldier's Run. She wants to make sure that the stream has an abundance of game fish (i.e. brook trout). Susan decides to hire you to take some samples and to calculate the WQR. Should Susan Button purchase the building?
Sample C: Henry and Roberta Sutton own a house on the outskirts of Brookstone Estates. They have lived there for 10 years now and have three young children. Often times, Roberta lets the kids go and play in the Eastern Branch Stream that runs next to their development. Recently, Brian has been coming home and complaining of an abundance of dead animals such as fish and frogs lying next to or floating in the stream. Henry and Roberta are concerned and so are their neighbors. They decide to hire you to research and calculate the Water Quality Rating of the stream. What they are not aware of, is that a little under two years ago, a farm was developed 5 miles South of their development. What advise can you give the Sutton's on their problem.





Extension Answer Key

<u>Sample A-</u> The WQR should equal nine, which makes the Patapsco River a poor quality stream. Therefore, Joe Smith should not purchase the property. The river seems polluted because of the factory that is located three quarters of a mile upstream from the property.

<u>Sample B-</u> The WQB equals twenty-four which makes Soldier's Run an excellent quality stream. Susan Button should purchase the building because there will be an abundance of fish.

<u>Sample C-</u> The WQB equals fourteen, which makes Eastern Branch a fair quality stream. The Sutton's are now able to go to the town and complain of pollution in the stream. Pollution in the stream is due to the farm located 5 miles south of their development.

Possible Answers to Discussion Questions

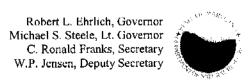
- 1. What information does a water quality rating provide? A water quality rating provides us with information that will tell us how healthy or not healthy a stream is. It also provides us with the types and numbers of organisms in a 3-foot by 3-foot area.
- 2. How reliable is a Water Quality Rating? A water quality rating can be reliable but is not completely accurate. It is not completely accurate because the sample may not have been taken perfectly. Weather conditions could have a negative impact on the sample. Unless many samples are taken from different parts of the stream it is difficult to get an accurate rating.

Differentiations

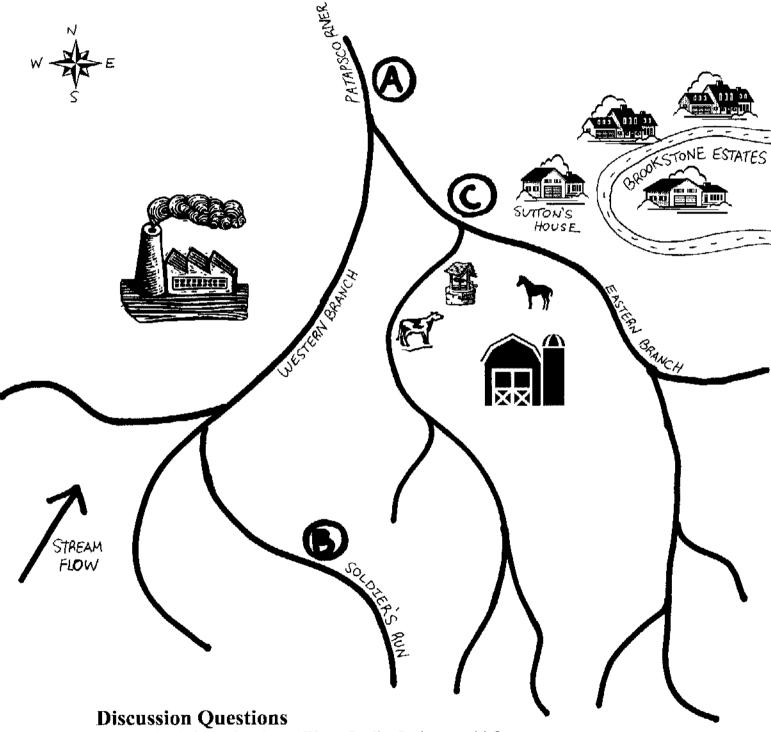
Students that finish early can use the blank survey on the back of sample C to create their own data and scenario. Have students get into partners to figure out the water quality rating.



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Maryland Streams Extension Activity One Map of Streams



- 1. What information does a Water Quality Rating provide?
- 2. How reliable is a Water Quality Rating?

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and consistent records of your observations and data from your macroinvertebrat quality. Refer to the SOS insect card and monitoring instructions to learn how to tra	
	te count, you can document changes in water.
Stream PRIOPSCO RIVER Station # A	# of participants
County Anne Arundel State MD Group or individua	
Location Central Maryland	
Weather conditions (last 72 hours)	
Date Average stream widthft Av	erage stream depth
Start Time End Time Flow rate: High Norma	aiXLowNegligible
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hellgrammite clams	B blackily larvae
	A leeches
mayfly nymphs crane fly larvae	_B_ midge larvae
mayfly nymphs crane fly larvae gifled snails crayfish	
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Compare this total index value to the following ranges of numbers to determine the water quality of your stream. Good water quality is indicated by a variety of different kinds of organisms, with no one kind making up the majority of the sample. Although the A, B, and C ratings do not contribute to the water quality rating, keep track of them to see how your macroinvertebrate populations change over time.

	WATER QUALITY RATING			
Excellent (>22)	Good (17-22)	Fair (11-16)	Poor (<11)	

October 1994

	
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The purpose of this form is to aid you in gathering and recording important data about the health of your stream. By keeping accurate and consistent records of your observations and data from your macroinvertebrate count, you can document changes in water quality. Refer to the SOS insect card and monitoring instructions to learn how to trap and identity stream macroinvertebrates and how to complete this form. __ Station #__ State MD Group or individual Mary land Weather conditions (last 72 hours) Average stream width____5-10 :ft. Average stream depth Flow rate: High_____ Normal If conducting rocky bottom sampling, select a riffle where the water is not running too fast, the water depth is between 3-12 inches. and the bed consists of cobble-sized stones or larger, Monitored riffle area (3' x 3' square) ______in., in riffle. Water temperature _ F° ? C° ? Take 3 samples in the same general area. Count each separately and report the highestscoring sample below. Sample _ reported of 3. If conducting muddy bottom sampling, take the required number of scoops from each habitat type: steep banks/vegetated margin (10 scoops), woody debris with organic matter (4 scoops), rock/gravel/sand substrates (3 scoops), and silty bottom with organic matter (3 scoops). MACROINVERTEBRATE COUNT Use the stream monitoring instructions to conduct a magrainvariebrate count, Use letter codes (A = 1-9, B = 10-99, C = 100 or more) to record the numbers of organisms found in a 3 foot by 3 foot area. Add up the number of letters in each column and multiply by the indicated index value. The following columns are divided based on the organism's sensitivity to pollution, SENSITIVE SOMEWHAT SENSITIVE caddisfly larvae beetle larvae 🗼 aquatić worms hellgrammite blackly larvae clams mayfly nymphs crane fly larvae leaches gilled snails craylish midge larvae riffle beetle adult damselfly nymphs pouch (and other) snails stonelly nymphs dragonily nymphs water penny farvae scuds 2DUÓWO2 fishfly larvae alderily larvae atherix # letters times 3 = # letters times 2 = # letters times 1 = index value index value index value Now add together the three index values from each column for your total index value. Total index value = _ Compare this total index value to the following ranges of numbers to determine the water quality of your stream. Good water quality is

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	**		crane fly larvae		leeches
	gilled snails		crayfish		midge larvae
_ 	riffle beetle adult		damselfly nymphs		pouch (and other) snails
	stonelly nymphs		dragonlly nymphs		
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